

What is claimed is:

1. A distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal, wherein:

the distortion compensator comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,

signal level change direction detection means that detects whether the direction of change in the level of the signal subject to amplification by the amplifier is the positive direction or the negative direction, and

signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation in the case that the direction of change in the signal level is the positive direction, and also stores the correspondence between the signal level and the mode of changing the signal for distortion compensation in the case that the direction of change in the signal level is the negative direction, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the direction of change in the signal level detected by the signal level change direction detection means and the signal level detected by the signal level detection means.

2. The distortion compensator according to claim 1, further comprising:

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced.

3. The distortion compensator according to claim 1, wherein:

the amount of change in the amplitude of the signal or the amount of change in the phase of the signal or both are used as the mode of changing the signal for distortion compensation.

4. The distortion compensator according to claim 2, wherein:

the amount of change in the amplitude of the signal or the amount of change in the phase of the signal or both are used as the mode of changing the signal for distortion compensation.

5. The distortion compensator according to claim 1, wherein:

a signal consisting of a plurality of frequency components is used as the signal subject to amplification by the amplifier.

6. The distortion compensator according to claim 2, wherein:

a signal consisting of a plurality of frequency components is used as the signal subject to amplification by the amplifier.

7. The distortion compensator according to claim 1, wherein:

the distortion compensator comprises:

a first splitter, a delay circuit, an amplitude detector, an A/D converter, a table switching circuit, a positive slope table block, a negative slope table block, a first switch, a second switch, a D/A converter, an amplitude/phase circuit and a main amplifier, where:

the main amplifier is the amplifier subject to distortion compensation,

the signal change means is constituted by the functions of the amplitude/phase circuit,

the signal level detection means is constituted by the functions of the amplitude detector,

the signal level change direction detection means is constituted by the functions of the amplitude detector and the functions of the table switching circuit,

the signal change control means is constituted by the functions of the A/D converter, the functions of the positive slope table block, the functions of the negative slope table block, the functions of the table switching circuit, the functions of the first switch, the functions of the second switch and the functions of the D/A converter, and where:

the first splitter splits the input signal, outputs one branch of the split signal to the delay circuit and outputs the other branch of the split signal to the amplitude detector,

the amplitude detector detects the amplitude level of the other branch of the split signal input from the first splitter and outputs the results of this detection to the A/D converter and table switching circuit,

the A/D converter converts the results of detection input from the amplitude detector from an analog signal to a digital signal which is output to the first switch,

the first switch has the function of switching the input destination of the output from the A/D converter between the positive slope table block and the negative slope table block,

the positive slope table block stores in memory amplitude correction data for correcting the amplitude and phase correction data for correcting the phase corresponding to the case in which the output from the amplitude detector is a positive slope, as a positive slope table keyed on the amplitude level and in addition, a lookup of this table is performed to read out the amplitude correction data and phase correction data corresponding to the results of detection of the amplitude level input from the A/D converter via the first switch and output this data to the second switch,

the negative slope table block stores in memory amplitude correction data for correcting the amplitude and phase correction data for correcting the phase corresponding to the case in which the output from the amplitude detector is a negative slope, as a negative slope table keyed on the amplitude level and in addition, a lookup of this table is performed to read out the amplitude correction data and phase correction data corresponding to the results of detection of the amplitude level input from the A/D converter via the first switch and output this data to the second switch,

the second switch has the function of switching the origin of output to the D/A converter between the positive slope table block and the negative slope table block,

the table switching circuit detects the direction of the slope in the results of detection input from the amplitude detector and switches the first switch and second switch so as to connect the positive slope table block to the A/D converter and D/A converter in the case in which this slope is in the positive direction, but switches the first switch and second switch so as to connect the negative slope table block to the A/D converter and D/A converter in the case in which this slope is in the negative direction,

the D/A converter converts the amplitude correction data and phase correction data input via the second switch from a digital signal to an analog signal which is output to the amplitude/phase circuit,

the delay circuit delays one branch of the split signal input from the first splitter and outputs it to the amplitude/phase circuit,

the amplitude/phase circuit applies to one branch of the split signal input from the delay circuit an amplitude distortion based on the amplitude correction data input from the D/A converter and also applies a phase distortion based on the phase correction data input from the D/A converter, and outputs to the main amplifier that one branch of the split signal with the amplitude distortion and the phase distortion applied,

the main amplifier amplifies and outputs one branch of the split signal input from the amplitude/phase circuit.

8. The distortion compensator according to claim 7, wherein:

the distortion compensator further comprises a second splitter, a distortion detector and a table update circuit, where

the signal change control content updating means, which updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced, is constituted by the functions of the second splitter, the functions of the distortion detector and the functions of the table update circuit,

the second splitter splits off a portion of the amplified signal output from the main amplifier and outputs this split signal to the distortion detector,

the distortion detector detects any distortion components remaining after distortion compensation in the split signal input from the second splitter, and outputs the results of this detection to the table update circuit, and

based on the results of detection input from the distortion detector, the table update circuit calculates amplitude correction data and phase correction data for both the positive slope table block and the negative slope table block so that the distortion components contained in the split signal acquired from the second splitter are minimized, and outputs the results of these calculations to the positive slope table block and the negative slope table block, respectively, thereby updating the amplitude correction data and phase correction data stored in the positive slope table block and the negative slope table block.

9. A predistortion type distortion-compensated amplifier having a distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal, wherein:

the predistortion type distortion-compensated amplifier comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,

signal level change direction detection means that detects whether the direction of change in the level of the signal subject to amplification by the amplifier is the positive direction or the negative direction, and

signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation in the case that the direction of change in the signal level is the positive direction, and also stores the correspondence between the signal level and the mode of changing the signal for distortion compensation in the case that the direction of change in the signal level is the negative direction, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the direction of change in the signal level detected by the signal level change direction detection means and the signal level detected by the signal level detection means.

10. The predistortion type distortion-compensated amplifier according to claim 9, further comprising:

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced.

11. A communication station unit of a mobile communications system having a distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal to be sent, wherein:

the communication station unit of the mobile communications system comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,

signal level change direction detection means that detects whether the direction of change in the level of the signal subject to amplification by the amplifier is the positive direction or the negative direction, and

signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation in the case that the direction of change in the signal level is the positive direction, and also stores the correspondence between the signal level and the mode of changing the signal for

distortion compensation in the case that the direction of change in the signal level is the negative direction, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the direction of change in the signal level detected by the signal level change direction detection means and the signal level detected by the signal level detection means.

12. The communication station unit of the mobile communications system according to claim 11, further comprising:

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced.

13. A distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal, wherein:

the distortion compensator comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,

signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the signal level detected by the signal level detection means, and

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced, and where

the timing of signals processed by the signal change means is asynchronous from the timing of controlling the signal change means based on the level of this signal by the signal change control means.

14. The distortion compensator according to claim 13, wherein:

the amount of change in the amplitude of the signal or the amount of change in the phase of the signal or both are used as the mode of changing the signal for distortion compensation.

15. The distortion compensator according to claim 13, wherein:

a signal consisting of a plurality of frequency components is used as the signal subject to amplification by the amplifier.

16. The distortion compensator according to claim 13, wherein:

the distortion compensator comprises:

a first splitter, a delay circuit, an amplitude detector, an A/D converter, a table block, a D/A converter, an amplitude/phase circuit, a main amplifier, a second splitter, a distortion detector and a table updating circuit, where:

the main amplifier is the amplifier subject to distortion compensation,

the signal change means is constituted by the functions of the amplitude/phase circuit,

the signal level detection means is constituted by the functions of the amplitude detector,

the signal change control means is constituted by the functions of the A/D converter, the functions of the table block and the functions of the D/A converter,

the signal change control content updating means is constituted by the functions of the second splitter, the functions of the distortion detector and the functions of the table update circuit, and where:

the first splitter splits the input signal, outputs one branch of the split signal to the delay circuit and outputs the other branch of the split signal to the amplitude detector,

the amplitude detector detects the amplitude level of the other branch of the split signal input from the first splitter and outputs the results of this detection to the A/D converter,

the A/D converter converts the results of detection input from the amplitude detector from an analog signal to a digital signal which is output to the table block,

the table block stores in memory amplitude correction data for correcting the amplitude and phase correction data for correcting the phase, as a table keyed on the amplitude level and in addition, a lookup of this table is performed to read out the

amplitude correction data and phase correction data corresponding to the results of detection input from the A/D converter and output this data to the D/A converter,

the D/A converter converts the amplitude correction data and phase correction data input from the table block from a digital signal to an analog signal which is output to the amplitude/phase circuit,

the delay circuit delays one branch of the split signal input from the first splitter and outputs it to the amplitude/phase circuit,

the amplitude/phase circuit applies to one branch of the split signal input from the delay circuit an amplitude distortion based on the amplitude correction data input from the D/A converter and also applies a phase distortion based on the phase correction data input from the D/A converter, and outputs to the main amplifier that one branch of the split signal with the amplitude distortion and the phase distortion applied,

the main amplifier amplifies and outputs one branch of the split signal input from the amplitude/phase circuit,

the second splitter splits off a portion of the amplified signal output from the main amplifier and outputs this split signal to the distortion detector,

the distortion detector detects any distortion components remaining after distortion compensation in the split signal input from the second splitter, and outputs the results of this detection to the table update circuit, and

based on the results of detection input from the distortion detector, the table update circuit calculates amplitude correction data and phase correction data so that the distortion components contained in the split signal acquired from the second splitter are minimized, and outputs the results of these calculations to the table block, thereby updating the amplitude correction data and phase correction data stored in the table block.

17. A predistortion type distortion-compensated amplifier having a distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal, wherein:

the predistortion type distortion-compensated amplifier comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,



signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the signal level detected by the signal level detection means, and

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced, and where

the timing of signals processed by the signal change means is asynchronous from the timing of controlling the signal change means based on the level of this signal by the signal change control means.

18. A communication station unit of a mobile communications system having a distortion compensator that compensates for distortion arising in an amplifier that amplifies a signal to be sent, wherein:

the communication station unit of the mobile communications system comprises:

signal change means that changes the amplitude or phase or both of the signal subject to amplification by the amplifier,

signal level detection means that detects the level of the signal subject to amplification by the amplifier,

signal change control means that stores the correspondence between the signal level and the mode of changing the signal for distortion compensation, and based on the content thus stored, controls the signal change means such that it changes the signal subject to amplification by the amplifier in a mode of changing the signal corresponding to the signal level detected by the signal level detection means, and

a signal change control content updating means that updates the content of the correspondence between the signal level and mode of changing the signal for distortion compensation stored by the signal level change control means so that the distortion contained in the signal after being amplified by the amplifier is reduced, and where

the timing of signals processed by the signal change means is asynchronous from the timing of controlling the signal change means based on the level of this signal by the signal change control means.